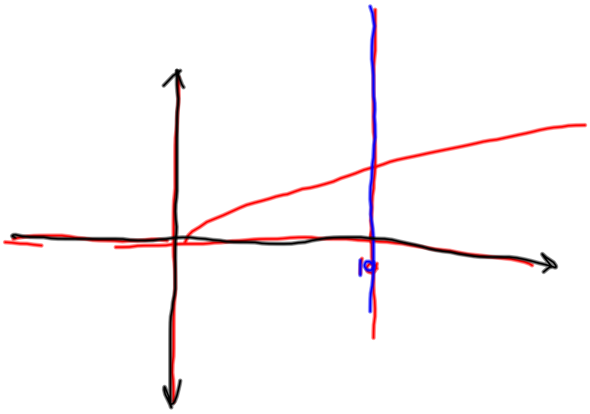
Let R be the region enclosed by the graph of $y = \sqrt{x-1}$

,the vertical line x=10, and the *x*-axis.

a) Find the area of R

$$A = \int_1^{10} \sqrt{x-1}\,dx$$



$$A = 18.0000 \text{ un}^2$$

$$\int \sqrt{x-1}\,dx = \int \sqrt{u}\,du = \int u^{1/2}\,du = \frac{2u^{3/2}}{3} = \frac{2}{3}(x-1)^{3/2}$$

$u = x-1$
$du = dx$

$$\int_1^{10} \sqrt{x-1}\,dx = \frac{2}{3}(x-1)^{3/2}\Big|_1^{10} = \frac{2}{3}(27) - \frac{2}{3}(0)$$

$$= \frac{54}{3} = 18$$

Let R be the region enclosed by the graph of $y=\sqrt{x-1}$

,the vertical line x=10, and the *x*-axis.

b) Find the volume of the solid generated when R is revolved about the horizontal line y=3.

$$\int_1^{10} \pi\left(\sqrt{x-1}-3\right)^2 dx = 42.4115$$

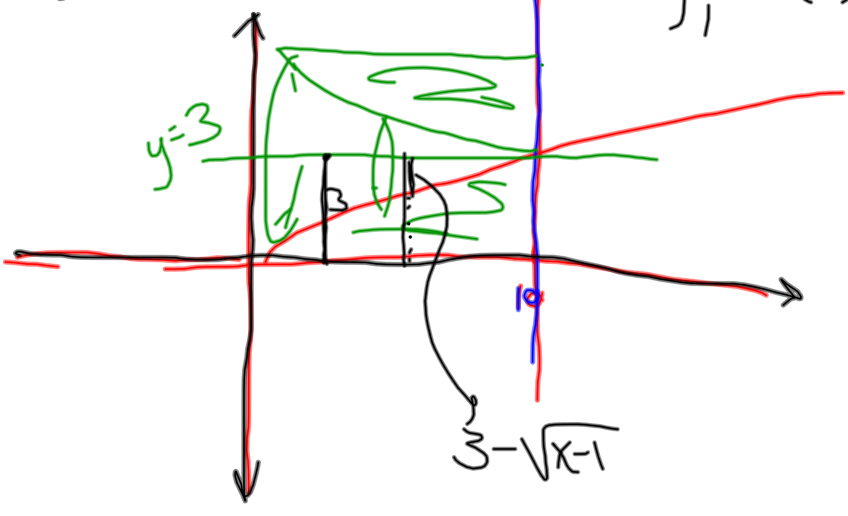
$$\int_1^{10}\pi(3)^2 dx - \int_1^{10}\pi\left(3-\sqrt{x-1}\right)^2 dx$$

$$\int_1^{10} \pi(3)^2 - \pi\left(3-\sqrt{x-1}\right)^2 dx$$

$$= 212.057$$

or

$$212.058$$

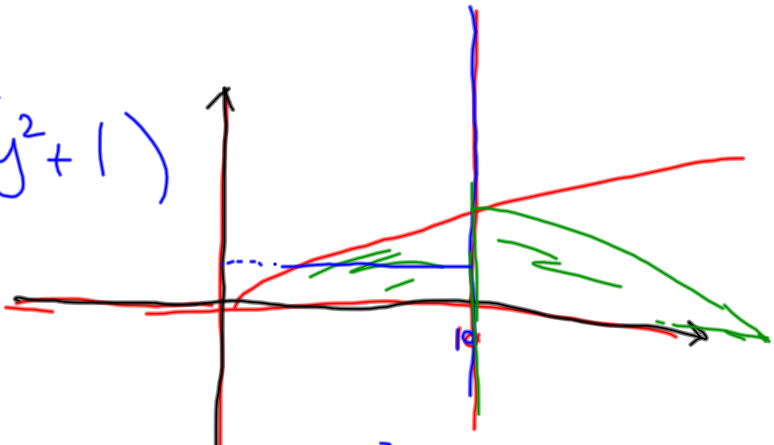


Let R be the region enclosed by the graph of $y = \sqrt{x-1}$

,the vertical line x=10, and the *x*-axis.

c) Find the volume of the solid generated when R is revolved about the vertical line x=10.

$r = 10 - x$
$= 10 - (y^2 + 1)$



$y = \sqrt{x-1}$
$y^2 = x - 1$
$y^2 + 1 = x$

$$V = \int_0^3 \pi \left(10 - (y^2+1)\right)^2 dy$$

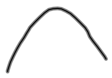
$= 407.150$

$t \in [0, 31]$ $R(t) = 5\sqrt{t}\cos\left(\frac{t}{5}\right)$ mosquitos/day

there are 1000 m.'s to start.

a) show that the number of m.'s is increasing at $t=6$.

$R(6) > 0$

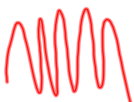


5 → 6

since the rate of chg is positive, # of m.'s will be increasing

b) At $t=6$, is the # of m.'s inc. at an increasing rate, or is it a decreasing rate?

$$R'(t) = 5\left(\frac{1}{2\sqrt{t}}\cos\left(\frac{t}{5}\right) + \sqrt{t}\left(-\frac{1}{5}\sin\left(\frac{t}{5}\right)\right)\right)$$



5 6 7

$R'(6) = $ [nDeriv(R(t), t, 6) $= -1.913$]

since $R' < 0$, the rate of chg R(t) is decreasing.

c) how many M.'s will be on island at $t=31$?

total m.'s at $t=31$ = starting m.'s + total chg $0 \to 31$

$$= 1000 + \int_0^{31} R(t)\,dt = 964.335$$

964 m.'s

[1000 + fnInt(R(t), t, 0, 31)]

math 9

d) what is the MAX number of mosquitos on $0 \le t \le 31$.

solve $R(t) = 0$

$t = 7.8539816$ * max

$t = 23.561945$ * min

#(t=0) = 100

#(t=31) = 9

$$\text{max \#} = 1000 + \int_0^{7.8539816} R(t)\,dt = 1039.357$$

Feb 25-7:39 AM

t	0	5	10	15	20	25	30	35	40
v(t)	7.0	9.2	9.5	7.0	4.5	2.4	2.4	4.3	7.3

a) midpoint Riemann sum, 4 sub-intervals of equal length and explain meaning of $\int_0^{40} v(t)\,dt$

approx $\int_0^{40} v(t)\,dt \approx$

$10(v(5)) + 10(v(15)) + 10(v(25)) + 10(v(35))$

$= 10(9.2 + 7.0 + 2.4 + 4.3) = 229$

$\int_0^{40} v(t)\,dt$ is the total change in position from $t=0$ to $t=40$ min, in miles.

It is the distance the plane flew in those 40 min.

Recall 4 approx of integrals

- left endpt R.S.
- right endpt R.S.
- mid point R.S.
- trapezoidal

t	0	5	10	15	20	25	30	35	40
v(t)	7.0	9.2	9.5	7.0	4.5	2.4	2.4	4.3	7.3

b) smallest number of instances where acceleration = 0

acceleration will be 0
somewhere on
$[5, 15)$ and $[25, 30]$

So min is 2 instances.

Feb 25-8:11 AM

t	0	5	10	15	20	25	30	35	40
v(t)	7.0	9.2	9.5	7.0	4.5	2.4	2.4	4.3	7.3

c) $f(t) = 6 + \cos\left(\frac{t}{10}\right) + 3\sin\left(\frac{7t}{40}\right)$

$a(23) =$

$a(t) = f'(t) = -\frac{1}{10}\sin\left(\frac{t}{10}\right) + \frac{21}{40}\cos\left(\frac{7t}{40}\right)$

$a(23) = -0.407$ or -0.408 mi/min^2

smart way [use nDeriv(f(t), t, 23) on calc]

Feb 25-8:11 AM

t	0	5	10	15	20	25	30	35	40
v(t)	7.0	9.2	9.5	7.0	4.5	2.4	2.4	4.3	7.3

d) average velocity

= average value of the velocity function $= \dfrac{1}{40-0}\displaystyle\int_0^4 f(t)\,dt$

$= 5.916$ mi/min

"Guaranted" 5 . . . . . 75%

so MC §1 : 21 out of 28

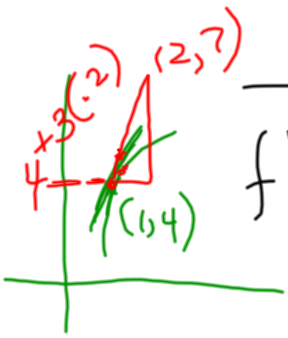
MC §2 : 13 out of 17

avg on FRQ : 7 out of 9 each

MC 18

$f'(x) = 2x+1, \quad f(1) = 4$

approx $f(1.2)$ by using tangent @ $x=1$



$f'(1) = 3$

$f(\text{"}x\text{"}) \approx f(1) + f'(1)(x-1)$

slope like thing

$f'(1) \approx \dfrac{f(x)-f(1)}{x-1}$

$= 4 + 3(x-1)$

$= 4 + 3(1.2-1)$

$= 4 + 3(.2) = 4.6$

4a)

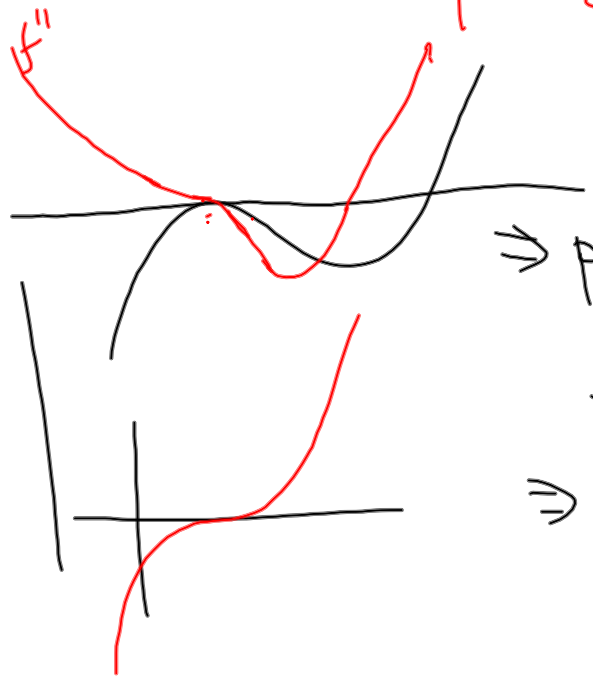
Points of Inflection

* point where the concavity of curve changes

⟺ * point where the sign of the second derivative changes.

→ either a point of discontinuity (2ND deriv doesn't exist)

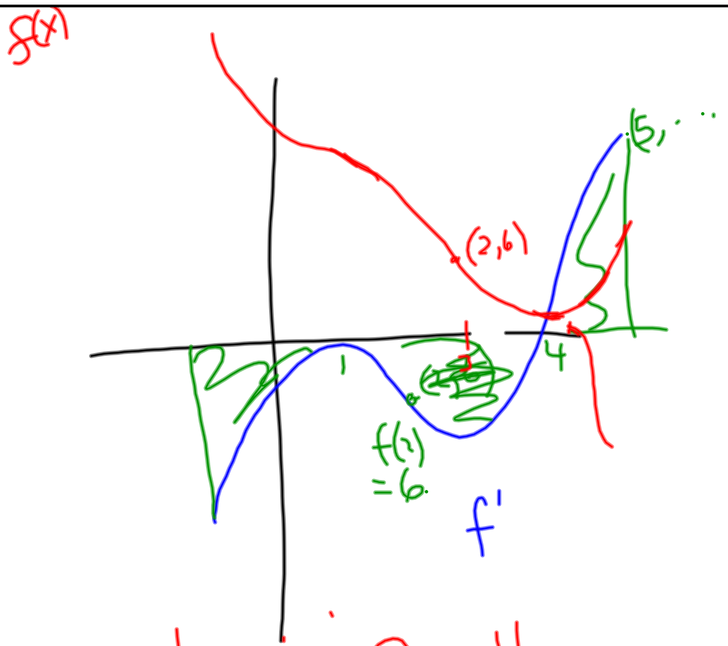
→ or a point 2ND deriv = 0



$x = 1, 3.$

⇒ points of inflection occur at rel extrema of the first derivative

⇒ points of inf occur when sign of 2ND chgs which occur when first deriv chgs from increasing to decreasing or vice-versa



anti-derivative
definite integral

$f' \Rightarrow f$ Area

* abs min
* abs max

! absolute min/max
$\Rightarrow$ including end points also

abs min: @ $x=4$
because function decreases from $f(-1)$ to $f(4)$ and then increases after that

abs max @ $x=-1$.
a comparison of the areas below the x-axis from $x=-1$ to $x=4$ and the area above the x-axis from $x=4$ to $x=5$ shows that the f^n decreases much further from $f(-1)$ to $f(4)$ than it gets back from 4 to 5

$$\left|\int_{-1}^{4} f'(x)\,dx\right| > \left|\int_{4}^{5} f'(x)\,dx\right|$$

4c) $g(x) = xf(x)$

$g'(x) = f(x) + xf'(x)$ at $x=2$

!! now I know why $f(2)=6$

$g'(2) = f(2) + 2f'(2)$

$= 6 + 2(-1) = 4$

$g(2) = 2 \cdot 6$
$= 12$

$y_0 \quad m \quad x_0$

$y - 12 = 4(x - (2))$

$$\frac{dy}{dx} = x^4(y-2)$$

① $$\int \frac{dy}{y-2} = \int x^4\,dx$$

② $$e^{\ln|y-2|} =$$ ③ $$e^{\left(\frac{x^5}{5}+C\right)}$$

④ $$|y-2| = e^C \cdot e^{\frac{x^5}{5}}$$ when $x=0, y=0$

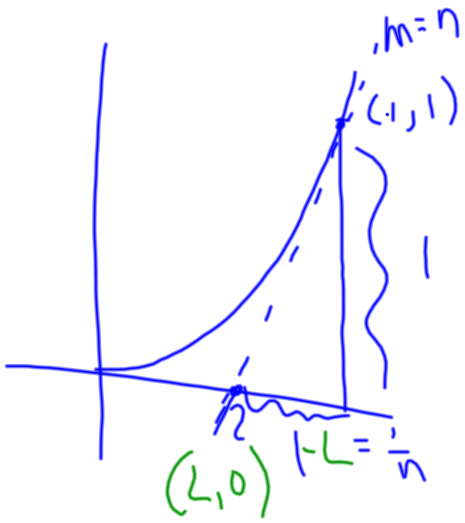
so ⑤ $|-2| = e^C e^0$ so $+2 = e^C$

and

$2 - y = +2e^{\frac{x^5}{5}}$ ⑥

$y = 2 - 2e^{\frac{x^5}{5}}$

$f(x) = x^n$



$f(x) = x^n$

$f'(x) = nx^{n-1}$

$f'(1) = n(1)^{n-1}$

$= n$

$A = \frac{1}{2} b h$

$= \frac{1}{2}(1-x)1$

$= \frac{1}{2}\left(\frac{1}{n}\right)(1) = \frac{1}{2n}$

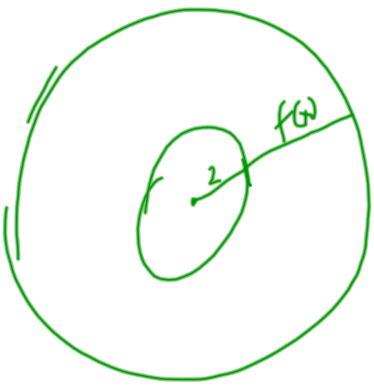
$m = n = \frac{1-0}{1-L} = \frac{1}{1-L}$

$1 - L = \frac{1}{n}$

Feb 27-7:53 AM

b

$$V = \int_{-1}^{0} \pi\left(\frac{x^3}{4} - \frac{x^2}{3} - \frac{x}{2} + 3\cos x - (-2)\right)^2 - \pi(2)^2\,dy$$



$$\pi\left(2+f(x)\right)^2 - \pi(2)^2$$

Mar 1-7:55 AM

have $f'(x)$

$$\int_a^b f'(x)\,dx$$

is the TOTAL CHANGE

from a to b.

actual y value = starting y-value + total change

to write an equation of a line

I need slope (m)

and a point $(a, f(a))$

$$y - f(a) = m(x - a)$$

$y = mx + b$

$y = mx + b$

$f(a) = ma + b$

$f(a) - ma = b$

"OLDEN DAYS" (pre-2012)

Multiple choice test released
approx every 5 ys
(but 18 month delay)

Most common free response collection
released every year
[[+ ... last 8 yrs .... an alternative set]]

Now a set of M/C
and a set of FRQ
released every year

Mar 1-8:35 AM